OPTICAL NONLINEARITIES AT THE INTERFACE BETWEEN LIQUID CRYSTAL AND GLASS: BEHAVIOR OF THE TRANSMITTED BEAM.

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During the past years a great interest has been devoted to the study of possible applications of non-linear interfaces, mainly in the field of Optical Bistability. Several papers have been published in this field, and some of them dealing with liquid crystals as non-linear material[1,2].

In this paper a study of the phenomena involved at the interface between liquid crystal and glass will be reported. The enphasis will be given to the transmitted optical beam instead to the reflected one as has been done in previous papers.

The main results that will be presented are:

- A strong variation of the transmitted beam profile, depending on the incident beam intensity. Other factors affecting this variation are: incidence angle, polarization of the incident beam at the interface, liquid crystal molecular orientation, and refractive indexes relation. The number of rings, due to the molecular reorientation, when a certain threshold is achieved, is different with respect to the reflected beam. The origin of this difference will be discussed.

- Different results depending on the liquid crystal phase taken, have been obtained too. Two cases have been studied: isotropic and nematic. At the isotropic phase, linearity is present when there is no transmitted beam because of total internal reflection. Non-linearities appear when both beams are present, namely transmitted and reflected.

In the case of nematic phase, due to thermal effects, a certain type of hysteresis loop is present.

Two types of liquid crystals have been used: MBBA and PCB. Our Ar^+ laser was operating with powers between 0 and 2 W and several focusing lenses were used depending on the situation. The lines used were 514.5 , 488 and 457.9nm. The influence of the line color on the nonlinear behavior will be presented.

REFERENCES

1.- J.A. Martin Pereda, SPIE 492, 370 (1984).

2.- I.C. Khoo, Appl. Phys. Lett. 40, 645 (1982).